

[001]

## VEHICLE GEARBOX

[002]

[003]

[004]       The invention concerns a vehicle gearbox with the characteristics of the preamble of claim 1.

[005]

[006]       Vehicle gearboxes of modern design comprise a large number of functionalities, which have to be accommodated in the housing of the vehicle gearbox. In the case of automated gearboxes, if the actuators have to be integrated in or on the gearbox, this makes its design elaborate and cost-intensive. At the same time, requirements relating to assembly methods appropriate for industrial practice must be fulfilled to make it easier for the assembler to combine together the individual structural elements of the gearbox in a manner suited to the case while avoiding assembly methods which are too complex and expensive.

[007]       To give an example, DE-A1 44 22 900 by the present Applicant shows a vehicle gearbox with a connection plate which is attached firmly on the transmission housing by screw-bolts and which is arranged in an area of the housing that extends toward a coupling device. On one of the countershafts of the vehicle gearbox, a transmission brake is arranged, parts of which are provided in the connection plate. The arrangement of actuating elements for actuating the torque-transmitting components in the gearbox and the arrangement of a clutch actuator are not described.

[008]       The purpose of the present invention is to integrate actuating elements of a vehicle gearbox at a central position in a manner appropriate for practical assembly.

[009]       This objective is achieved by a vehicle gearbox having characteristics in accordance with Claim 1. Design features are the object of subordinate claims.

[010]

[011] A vehicle gearbox comprises a housing in or on which torque-transmitting components are provided. These also include a coupling device between the vehicle gearbox and a drive machine which drives the vehicle gearbox. Actuating elements for actuating the torque-transmitting components are arranged on or in the housing. The housing comprises an area extending in the direction of the coupling device in which a connection plate is provided that can be attached firmly to the housing. Lodgements are provided in this connection plate for at least parts of the actuating elements for actuating the torque-transmitting components. In an advantageous embodiment of the invention, a lodgement is provided in the connection plate for at least parts of an actuating device of the coupling device between the drive machine and the vehicle gearbox. Preferably, the coupling device is a clutch with central disengagement. Particularly advantageously, the connection plate on the coupling device is made in the form of two tubes, one inside the other, and an actuating piston is arranged so that it can move axially in the annular space between the tubes.

[012] In a further advantageous embodiment of the invention, a lodgement is provided in the connection plate for actuating elements that shift gear wheels of the vehicle gearbox into or out of a torque-transmitting condition. Preferably, the actuating elements are parts of a shift system of a main gearbox section and/or of a splitter group gearset and/or of a range-change group gearset of the vehicle gearbox. The actuating elements advantageously comprise pneumatic cylinders, one part of which is formed by the connection plate and one part of which is formed by the housing.

[013] A vehicle gearbox of such design with a connection plate enables the advantageous and assembly-friendly integration of many essential components and functional elements at a central location. Besides the clutch actuation and the actuation of the shift elements, at least parts of the transmission brakes and of the gearbox oil pump are provided in the connection plate. The connection plate can be made independently of the remainder of the gearbox housing and is, therefore, easily accessible at any points for processing tools. Screw-bolts ensure simple

fixing of the connection plate onto the housing during the assembly of the vehicle gearbox.

[014]

[015] The invention is explained in more detail with reference to a drawing, which shows:

[016] FIG. 1 is a cross-section through part of the vehicle gearbox, and

[017] FIG. 2 is another cross-section similar to FIG. 1.

[018]

[019] FIG. 1 shows a vehicle gearbox 2 which comprises a housing 4. A drive input shaft 6 is connected to a drive machine 8, as a rule an internal combustion engine, and is mounted in the housing 4 to rotate in a bearing 10. Mounted to rotate with the input shaft 6 is a gear wheel 12 which meshes with a gear wheel 14 on a first countershaft 16 and with a gear wheel 18 on a second countershaft 20.

[020] Here, the invention is described with reference to the vehicle gearbox 2 with power distribution to two countershafts. It retains its validity in the same manner, however, for a gearbox with one countershaft.

[021] The first countershaft 16 is mounted in a conical-roller bearing 22 in the housing 4 and has a transmission pump 24 at one end which is driven by the countershaft 16 for delivering lubricating oil to the gearbox. The second countershaft 20 is mounted in a conical-roller bearing 26 in the housing 4 and has a transmission brake 28 at one end of the known structure which brakes the countershaft 20 and thus also the entire vehicle gearbox 2, and which is used, for example, during gearshift processes. Around the input shaft 6, a coupling device 30 of known structure is arranged between the vehicle gearbox 2 and the drive machine 8, which is not an object of the present invention and of which, here, only parts are, therefore, shown for illustrative purposes.

[022] In the area of the housing 4 that extends toward the coupling device 30 is arranged a connection plate 32, which is fixed firmly to the housing, for example, by screw-bolts (not shown here). In a known way, the connection plate 32

accommodates at least parts of the transmission oil pump 24 and the transmission brake 28. Furthermore in the area of the input shaft 6, the connection plate 32 is shaped so as to form two concentric tubes 34 and 36, one inside the other. In an annular space 38 between the tubes 34 and 36, an annular piston 40 is provided. Radially inward toward the tube 36 the said annular piston 40 has a first seal 42 and radially outward toward the tube 34 the annular piston has a second seal 44. The seals 42 and 44 seal the annular space 38 airtight with respect to the surroundings, so that the annular piston 42 can be moved axially by an actuation medium, preferably compressed air, admitted into the annular space 38 so as to actuate a disengagement bearing 46 to open the coupling device 30. Compressed air can be supplied directly through the housing, so that hoses and pipes for compressed air delivery are not needed. Electrical leads for a path sensor (not shown here) on the coupling device 30 can also be passed directly through the housing 4 or the connection plate 32. To assist the movement of the annular piston 40, an annular spring 48 is provided, which is accommodated in the annular space 38 between the annular piston 40 and the connection plate 32.

[023] The indexes used in FIG. 2 are the same as those of FIG. 1 for corresponding components. Furthermore, FIG. 2 shows a first cylinder portion 50 in the connection plate 32 which, together with a second cylinder portion 52 formed in the housing 4, constitute an actuation cylinder 64 for a shift device (not shown in any greater detail here) in a main transmission section of the vehicle gearbox 2. For this, in the actuation cylinder 64 formed by the two cylinder portions 50 and 52 is inserted an axially movable piston 54, to which is attached a gearshift rod 56 which extends as far as the main transmission section. This piston 54 is also actuated by compressed air which passes into the actuation cylinder 64 through bores (not shown here) in the connection plate 32 or the housing 4.

[024] A sliding sleeve 58 is part of a splitter group gearset, which is connected upstream from the main transmission section. The sliding sleeve 58 is actuated by a gearshift rod 60 connected to a piston 62. The piston 62 is arranged to move axially in an actuation cylinder 66 and is actuated by compressed air, which can again be delivered to the actuation cylinder 66 through bores in the housing 4 or

the connection plate 32. A first cylinder portion 68 of the actuation cylinder 66 is provided in the connection plate 32 and a second cylinder portion 70 is formed by the housing 4.

[025] In a third cylinder (not shown here), another third piston can be arranged which, via a further gearshift rod, shifts the sliding sleeve of a range-change group gearset connected downstream from the main transmission.

Reference numerals

2	vehicle gearbox	38	annular space
4	housing	40	annular piston
6	drive input shaft	42	seal
8	drive machine	44	seal
10	bearing	46	disengagement bearing
12	gear wheel	48	annular spring
14	gear wheel	50	cylinder portion
16	countershaft	52	cylinder portion
18	gear wheel	54	piston
20	countershaft	56	gearshift rod
22	conical-roller bearing	58	sliding sleeve
24	transmission pump	60	gearshift rod
26	conical-roller bearing	62	piston
28	transmission brake	64	actuation cylinder
30	coupling device	66	actuation cylinder
32	connection plate	68	cylinder portion
34	tube	70	cylinder portion
36	tube		